CHALMERS

Joint European Investments in Defence Research and Technology

An Evaluation of the European Defence Agency's Joint Investment Programme on Force Protection

Master of Science Thesis in Technology Management and Economics

JOHAN GRANBERG

Department of Technology Management and Economics
Division of Technology and Society
CHALMERS UNIVERSITY OF TECHNOLOGY
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JOHAN GRANBERG

Tutor, Chalmers: Erik Bohlin
Tutor, FMV: Anders Berg

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Johan Granberg

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Department of Technology Management and Economics
Division of Technology and Society
Chalmers University of Technology
SE-412 96 Göteborg, Sweden
Telephone: + 46 (0)31-772 1000

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Abstract

Increased European interdependence together with reduced national defence budgets have been driving forces for defence materiel cooperation. The majority of earlier cooperative defence projects have been bilateral between *national champions* and very few have included contributions from the smaller countries in Europe. Increased interest in cooperation resulted in the creation of the European Defence Agency in 2004. Its 26 members are the EU member states, less Denmark, and their combined defence budgets constitutes seventeen per cent, or $295 billion, of the world's military spending. In 2007, the European Defence Agency started a new structure for multinational funding of research and technology on the European defence market, called Joint Investment Programmes. The first programme was a joint effort by twenty member states to invest in eighteen different technology projects within the field of *Force Protection*, with a combined value of some €55 million. The eighteen projects were awarded to different consortia of suppliers in four separate *calls for proposals* spread out over a period of two years. The programme also had an objective of increasing integration on the European defence market. To achieve this end, only international consortia of suppliers were eligible to participate, and at least one of the actors had to be a small or medium-sized enterprise or an academic institution. Measures were taken to ensure that contracts were awarded to participating industries in relation to their national financial contribution, in a *Global Balance* arrangement.

The purpose of this master's thesis project has been to investigate the contractual agreements and the rules in the *calls for proposals* in programme and their effects on the quality of the received proposals from the consortia. The goal has been provide guidance for Sweden's, and possibly other member states', participation in future programmes with the European Defence Agency. A longer-term ambition is to find possibilities for improvement of the contract mechanisms in order to achieve higher quality in future programmes. The thesis work has been divided in a quantitative analysis and a qualitative study, which have been merged into a final analysis. The quantitative study consisted of a simulated re-evaluation of the contracts, with only price and quality as input variables. The qualitative part was based on interviews with evaluators and managers as well as with representatives from involved industries.

The findings point to differences in the reception of the programme arrangement, where the smaller companies saw it as a way to enter the otherwise closed international defence market. Within the bigger companies, the arrangement was regarded somewhat as a threat to *business as usual*, while at the same time as an opportunity to form new alliances and develop sought-after competences. Regarding the selected proposals, findings indicate that these consortia were motivated and competent to provide high quality projects at reasonable cost. Consortia size and the number of participating nations are found to be high. Enough proposals were received to ensure a sound degree of competition and the selected consortia were well motivated. Fewer participants would have reduced the complexity and cost of cooperation.

Keywords: Research and Technology Cooperation, European Defence Agency, Joint Investment Programme, Offset, Global Balance

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1 Introduction

This section of the report will present the background and the purpose, as well as the scope of the master thesis project. This chapter will introduce the readers to this thesis topic and provide a foundation by presenting the European defence market as well as a short history on the topic. The chapter ends with a presentation of the research questions used in the thesis. The thesis project has been performed in collaboration with the Swedish Defence Material Administration, the Swedish government's counterpart to the European Defence Agency.

1.1 Background[1]

In 2007, the European Defence Agency started a new programme structure for multinational investments in research and development on the European defence market. These were called *Joint Investment Programmes* (JIP:s). The first *Joint Investment Programme* was a joint effort of twenty member states[2] to invest in eighteen different technology projects within the field of *Force Protection*. *Force Protection* is a term for measures taken to deter and protect a military force from hostile actions, and was very much called for during this time due to the wars fought in Iraq and Afghanistan. This programme, JIP-FP, had a combined value of approximately 55 million euros. The eighteen different projects were awarded to consortia of suppliers in four separate *calls for proposals* spread out over a period of two years.

The programme also had an objective of increasing the integration of the European defence market, which is highly fragmented. To achieve this end, only international consortia of suppliers were eligible to participate, and at least one of the suppliers had to be a small or medium-sized enterprise (SME) or an academic institution. This was also done to take advantage of the innovativeness within smaller actors, in order to increase the overall competitiveness of the European defence industry.

In the programme, there was an offset mechanism called *Global Balance* to ensure that each member state's industry received project contracts corresponding to that member state's investment in the programme. This worked by awarding higher scores in subsequent *calls for proposals* to suppliers from the countries that were not awarded any contracts in the previous calls. Hence, subsequent *calls for proposals* were conducted in a form of adjusted public procurement, where the best suppliers might be handicapped in their participation. This was done in order to spread technological knowledge over the European defence industrial base. In reality, this meant spreading knowledge mostly from established defence contractors in Western Europe to less technologically advanced counterparts in Eastern Europe.

There were also special intellectual property rights associated with the programme. All member states, regardless of their investment in the programme, had the right to use the results of the projects for defence purposes without charge. The originators of the results were

[1] Based on EDA Programme Arrangement PA No A-0120-RT-GC, the press briefing of the 14th December 2007 and an interview with the founding programme manager.

[2] Austria, Belgium, Cyprus, the Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, The Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain and Sweden

still the patent holders, but had limited possibilities of selling the results to the contributing member states. With twenty participating countries, including some of the biggest military spenders in the world, a considerable part of the market could be difficult to profit from. This included the home market, which is often a very important market for defence companies.

The results of the programme have mainly been knowledge building, in the form of reports, articles, demonstrations and prototypes. This is because the mandate covers the lower technological maturity levels and that further development would need a larger budget. Continuations of the projects, including commercialisations, were welcome in new or existing settings; however, very few of the projects have been further developed after the end of the programme. One main reason stated for this has been the unwillingness by the participating countries to send more money to international projects in the wake of the financial crisis.

1.1.1 The European Defence Market

Only one country in the world, the United States, is self-sufficient in terms of military equipment and technology. All other countries depend to some varying extent on import and on international cooperation (Lundmark, 2011). The European defence market is characterized by a large number of large and medium sized defence industry companies. These were often originally aiming at supplying the national needs of their respective countries, but have in later years become more export oriented. Even though many countries try to keep a national defence industry, for instance by avoiding public procurement guidelines, decreased defence budgets and increased costs have led to more international consolidation and cooperation (Hartley, 2008).

While most of the members of the European Union are also members of NATO and rely heavily on US suppliers of advanced defence equipment, increased European cooperation resulted in the creation of the European Defence Agency in 2004. The combined defence budget of the agency's member states constitutes 17 per cent, or about 295 billion dollars, of the world's military spending, see Table 1. That makes is the biggest entity after the United States which alone accounts for 41 per cent (SIPRI, 2010). The member states of European Defence Agency are also home to 39 of the world's 100 largest arms producing and military services companies (SIPRI, 2010).

Country	Defence budget $bn	Defence budget % in EDA	Companies in SIPRI top 100	Revenue top companies $M	Participation JIP-FP
Austria	3,6	1,3%			2,2%
Belgium	5,3	1,9%			2,8%
Cyprus	0,4	0,1%			0,2%
Czech Republic	3,1	1,1%			1,1%
Estonia	0,5	0,2%			1,0%
Finland	3,1	1,1%	1	670	3,6%
France	61,3	21,5%	10	31150	*21,8%*
Germany	42,9	15,0%	5	8040	*18,2%*
Greece	9,1	3,2%			*1,8%*

Hungary	1,8	0,6%			1,1%
Ireland	1,3	0,5%			1,3%
Italy	36,8	12,9%	10	24150	*4,8%*
Netherlands	11,7	4,1%	1	770	7,3%
Norway	6,2	2,2%	1	740	*2,7%*
Poland	8,8	3,1%			18,2%
Portugal	4,4	1,5%			*1,3%*
Slovakia	1,3	0,5%			1,8%
Slovenia	0,7	0,3%			1,3%
Spain	17,1	6,0%	4	6040	*4,8%*
Sweden	6,2	2,2%	2	3670	*2,7%*
Participants JIP-FP	225,601	77,5%	34	75230	100,00%
United Kingdom	55,73	21,2%	5	50850	
Romania	2,1	0,7%			
Malta	0,06	0,0%			
Latvia	0,3	0,1%			
Luxembourg	0	0,0%			
Lithuania	0,4	0,1%			
Bulgaria	0,8	0,3%			
Total EDA	284,991	100,0%	39	126080	

Table 1 - Participating member states and their respective defence spending

1.2 Problem Description

Since the programme was the first of its kind and implemented several features novel to defence projects, it is of interest to examine how this affected the programme. Since the quality of the performed projects will be examined independently after completion, the problem to be investigated here is concerned with the effects on all the received proposals in the programme.

On the one hand, more countries are likely to take part in the programme if they can be confident that their industry will be awarded contracts corresponding to the national investment. The bigger the total investment is, the bigger will the gains from cooperation be. On the other hand, if contracts in the later *calls for proposals* are awarded to inefficient suppliers due to the equalising mechanism, the value of the programme as a whole is deflated by poor quality of selected proposals. Therefore it is of interest to examine how *Global Balance* affected the quality of selected proposals and the value of the *Joint Investment Programmes.*

Another aspect that is of interest is how the *intellectual property rights* arrangements affected the quality of the proposals. There have been indications that some actors choose not to participate in the programme specifically due to the intellectual property rules. Once again, these rules make the programme more attractive for the contributing member states, since they will have better access to the programme's results. On the other hand, the possibilities

for the consortia to profit from the results, and hence their willingness to contribute to high quality projects, are diminished by not having full rights to sell the achieved results.

An additional goal of this study is to use the findings to provide guidance for Sweden's, and possibly other member states', participation in future programmes with the European Defence Agency. A longer-term ambition is to find possibilities for improvement of the contract mechanisms in order to achieve higher quality of proposals in future programmes.

1.3 Purpose

The purpose of this master thesis is to investigate the contractual agreements and the rules in the *calls for proposals* in the *Joint Investment Programme on Force Protection* and their effects on the received proposals from the consortia.

1.4 Delimitations

While other contractual agreements on multinational technology cooperation might be used for comparison, only the *Joint Investment Programme on Force Protection* will be examined in detail in this master thesis.

The performance of the projects has not been examined in this study. Only the quality of the proposals and how it was affected by the programme arrangement and not the actual quality of the delivered results will be investigated in detail.

1.5 Research Questions

The master thesis project aims at fulfilling the thesis purpose by dividing the problem into two research questions and answering these. The first research question is:

> ”*How was the quality of the selected proposals affected by the contractual arrangements and the evaluation guidelines in the programme?”*

This is of interest in order to examine the procurement process in the programme. It has to do with two processes; what quality is encouraged in the programme and whether or not the best of the received proposals are selected. The second research question is:

> *”What were the effects of the contractual arrangements and the evaluation guidelines in the programme for the Swedish participation?”*

This question is interesting to answer due to the differences between participating countries with regards to their respective defence industries, share of programme budget etcetera. Different actors in different countries benefit differently from the programme arrangement, what is beneficial for one country might be disadvantageous for another, and Sweden is used as an example.

2 Method

This chapter aims at describing the process and the activities during the process of writing this thesis. The collection of data both through the literature study and the empirical research is described in detail.

The study began with an overview of the contracts and of internal documents from the programme. This was followed by a general literature study in order to gain a better understanding of the topic and to prepare for a more relevant interview study.

The interview study was followed by quantitative analysis, focusing on identifying equilibria supported and contradicted by the empirical evidence. This was combined with simulations to examine differences when the number of *calls for proposals* is changed. The literature study was continued in order to draw conclusions on how the proposals were affected by different contractual arrangements and organisational settings. In this sense, the study has had both qualitative and quantitative elements that have been combined in order to address the research questions. Doing so allows for the detection and identification as well as the explanation of relationships. (Bryman & Bell, 2007)

2.1 Literature Study

While there is limited prior research to be found on European Union defence research cooperation, other types of defence and technology research cooperation could be used as a base of understanding. Theories on procurement and cooperation have also been used. Academic research articles were found using database searches based on keywords suggested by experienced researchers as well as found during the research process. Theoretical findings will be presented in the next chapter.

2.2 Interviews

Current and prior stakeholders in the programme have been interviewed. Representatives from one company invited but not participating in the *calls for proposals* have also been interviewed. Semi-structured interviews have been used in order to get complete and comparable responses while still recognizing that the interviewees might possess knowledge and insights not thought of during the interview preparations. (Ryen, 2004: 16) An interview guide can be found in Appendix 1. While the main part of the interviews has taken place in one-on-one settings, some follow-up questions have been asked using e-mail. Answers by e-mail might be deliberately slanted, but can also be more accurate, with the interviewee given more time to respond. (Ryen, 2004: 202) When interviewing the consortia, sensitive information involved called for anonymous presentation. In this way, some information sensitive for business relations could also be used.

In order to achieve a high level of reliability and to verify the theoretical implications of the programme arrangement, different stakeholders have been interviewed. A list of the non-anonymous interviewees is provided at the end of the report. The limited number of interviewed company representatives is due to practical difficulties in finding respondents and

the focus of the interviews is therefore of an open qualitative nature. Getting representative interview data for a quantitative study would have called for a sample larger than practically possible (Bryman & Bell, 2007).

In order to gain a deeper understanding of the topic and of the characteristics of the European defence industry market, the study began with interviews with industry experts before it was continued with interviews with relevant stakeholders.

2.2.1 Industry Experts

Academics in the research field of defence industry cooperation were found through a web search and were able to participate in interviews as well as providing valuable resources. An independent senior industry advisor, formerly with the *Swedish Security and Defence Industry Association*, was also able to provide a sound comprehension of the market, from a commercial point of view.

2.2.2 Participating Companies

Representatives from two of the programme's participating entities have been interviewed, with regards to how the consortia were formed and how the proposals were designed. These two entities can be considered representative for many of the participating companies, with regards to size, organization and business areas. One entity is a multinational firm while the other is a national research institute.

2.2.3 Non-participating Companies

Three representatives from a non-participating company have been interviewed. The company was invited to take part in the programme by their government's representative and was also approached several times with propositions for consortia building, since it has experience and competence in several of the technology areas. Hence, an educated choice not to participate with a proposal or as a consortia member was made. The interview was focused on why participation was turned down and how a different decision might have been reached. This was helpful in order to further understand the commercial process of submitting a proposal and the factors involved in making such a decision.

2.2.4 Agency and Government Representatives

Most of the interviews conducted have been with representatives from the European Defence Agency. They were involved as Programme Managers, with overall responsibility for the programme, as chairpersons of the Evaluation Committees, heading the evaluation of proposals, in the Executive Management Groups, running the projects or in the Management Committee, the steering group for the programme. There were considerable differences in how much time each person had spent with the programme, and several of the respondents have had more than one role, often as a national representative. All the interviews were performed in one-on-one sittings, in order not to influence their responses. Since these stakeholders have been involved during the completion of the project, the interviewees were reminded that only the evaluation of received and selected proposals were under examination.

Questions about the actual performance of the different projects were asked at the end of the interviews in order to get a better understanding of the full programme.

2.3 Simulating Evaluation

In order to assess which proposals had been selected without the rules regarding *global balance* and cooperation, all the proposals were examined and ranked solely based on their technical quality. They were thereafter selected based on the existing budget for funding. In a second round of simulation, the final ranking was performed after removing overlapping research objectives. These results are compared with the actual outcomes.

2.3.1 Measuring Quality

There are many different definitions of quality, such as Joseph Juran's "*fitness for use*" or Philip Crosby's "*conformance to requirements*" (American Society for Quality). Since measuring the quality of the different proposals in programme would require expert knowledge in the different technology fields, it lies beyond what is possible for this study. Instead, a proxy measure has been used, namely combining two of the evaluation criteria used by the European Defence Agency's evaluation committees, "*capability improvement*" and "*research and technology excellence*". The evaluation committees were staffed with experts in the relevant fields assigned by the member states' representatives. Appendix 2 (Evaluation guide) outlines how these reports were filled out. In the final *consensus report*, with the scores used as quality proxy, the opinions from the entire group of evaluators were put together. Besides the two factors used for the quality proxy, the final score was also based on "*management", "value for money"* and "*cooperation"*. These factors have less to do with the objective quality of the proposal but are more affected by the special arrangements this study is seeking to evaluate. Since the two factors used as proxy carried the highest weights in the evaluation, no major deviations from the original scoring are expected.

2.4 Use of Databases

In order to asses and rank countries on basis of their defence industry, *Stockholm International Peace Research Institute,* SIPRI:s databases have been used. SIPRI does have reliable information on the European nations military spending, as well as on the revenues of the largest defence companies. Using revenues of defence companies is problematic, since many of them are international conglomerates, with major operations and ownership in more countries than their home countries. The ranking is made with regards to the companies' military related revenues, which in several cases make up only a fraction of the total revenues. The ownership structure also makes the number of companies on the list a less than perfect proxy for the countries' defence industries. For example, Italy, with ten companies among the one hundred largest in the world, has one company as the owner of five of the others. Therefore, the total arms related sales of the companies on the list are used as proxy. It should be noted that this serves as indications and not as a definitive measure how established a country's defence industry is, and could be accompanied with other references as well.

2.5 Confidentiality

Due to business confidentiality, company names will not be used in the report. While the selected companies´ names have already been published in press releases etcetera, all names have been removed from the final report in order to make identification of single entities impossible. The interviewees from participating companies will also remain anonymous. Since the purpose of the study is to gain a general understanding of the impact of the programme arrangement and contract forms, the factor of confidentiality is unlikely to have any effect on the usefulness of the study.

2.6 Reliability and Validity

With regards to the quantitative part of this study, the question of reliability is of little concern since the data is collected from the official first hand sources. The validity is more difficult to assess, since the sample of proposals must be representative in order to draw any far-reaching conclusions. A cause for concern is that this was the first programme of its nature and whether it can be deemed representative for more than this specific programme is something that will be discussed in more detail later on. For the purpose of assessing this programme, the validity is high due to the use of the entire population of proposals in the study.

In qualitative research, it is useful to assess *trustworthiness* and *authenticity*. The latter is connected to *action research* and of limited interest in this study. Trustworthiness, according to Guba and Lincoln, is made up of four criteria: *credibility, transferability, dependability* and *confirmability*. (Bryman & Bell, 2007) *Credibility* has been achieved via triangulation, with more than one person interviewed on every aspect. This was not possible in the case of the participating companies interviewed, why this has been kept in mind during the analysis of the material. The *transferability* of the study is recognised by describing the special characteristics of the European defence industry and noting that while findings might not be applicable to any industry of market, they have validity outside of the case study. The factor of anonymity has some negative effect on the transferability of the study, while the number and diversity of the interviewees improves transferability. *Dependability* has been assured by employing overlapping methods, describing the research process and by discussing the process with peers in similar situations. *Confirmability* of the study is established by reflecting over possible obstacles for objectivity and by describing in the concluding discussion any preliminary theories or beliefs held by the researcher (Shenton, 2004).

3 Theoretical Framework

This chapter will describe the theoretical background and framework used in this study. This chapter will present the reader with the literature study of this thesis. The chapter is introduced with theory regarding benefits and costs of cooperation in research and development and continues with discussing pricing and value of such work. The chapter ends with some theory on what makes defence markets in general and the European defence market in particular unlike any other market.

3.1 Cooperation in Research and Development

Cooperation between firms within the field of research and development is becoming more common, especially in the hi-tech sector – firms that conduct a lot of research and development also cooperate within that field. Reasons for inter-firm cooperation are many. Reducing risk and financial constraints or increasing speed when accessing new knowledge and technology are the most important ones. However, companies need a specific skill set in order to make the most out of their cooperative efforts, namely absorptive capabilities. It has been shown that firms with successful research and development efforts are successful in their collaborative efforts as well (Miotti & Sachwald, 2003). This has to do with the need for the cooperating entities to be on a similar technological level, but also with the benefits created by a history of cooperation, creating mutual understanding and respect for competences and differences. It can be that personal ties are built between the people actually involved, but it can also be the creation of an organisational culture encouraging cooperation (Axelsson & Lundmark, 2010). Research and development cooperation has been shown not to be very effective in improving short-term productivity. However, since the partners are learning to cooperate, productivity is enhanced in the long run (Defazio et al., 2008).

While inter-firm cooperation usually occurs between non-rival firms, it can also take place between competitors. This form, called *coopetition* (Hunt, 1937), can be very effective in creating new innovations and value due to well-aligned interests and competences. However, appropriation of the created value can prove difficult, since the firms are competing on the same market (Ritala & Hurmelinna-Laukkanen, 2009). Another risk with *coopetition* is that of unintentional knowledge leaking to an opportunistic partner, when transferring more information than what was needed for the collaborative effort. These drawbacks result in difficulties building the trust needed for effective collaboration between the partners (Quintana-Garcia & Benavides-Velasco, 2004).

3.2 Coordination costs

As discussed above, reasons for cooperation are plentiful. However, as noted, cooperation can also be cause for problems, which in commercial projects can have effects on quality, timekeeping and budget. In defence projects, the consequences can also be diplomatic and security related. The combined effect can be described as in Figure 1 below, where the benefits from adding another partner outweighs the cost in the beginning, while the opposite is true after a sufficient number of participants have been added. Since many different factors are involved in this process, there are no absolute numbers for when the maximal

performance occurs. In the following sections, some important factors are introduced in further detail.

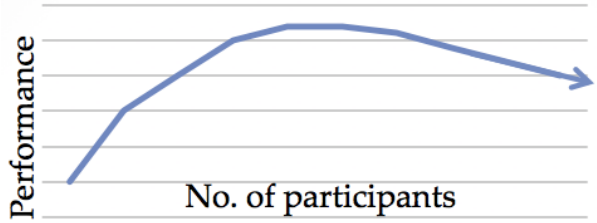

Figure 1 - The connection between performance and the number of cooperating parties

3.2.1 Complexity of Communication

In order to assess complexities in networks, be they social, commercial or digital, graph theory is useful. In some sort of physical cooperation, the number of phone calls, contract translations and signatures, plane tickets and hotel nights are correlating with the number or network connections. A complete graph is a network with connections between all the nodes, making the total number of connections c when n is the number of nodes: $c = \frac{n \cdot (n-1)}{2}$.

As the example in Figure 2 shows, a network of five nodes have ten connections while a network of six nodes have fifteen different connections.

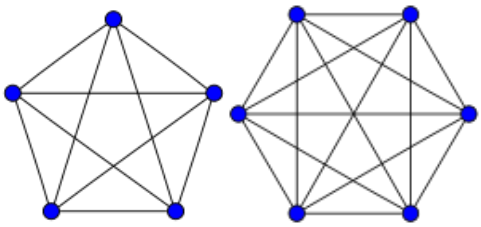

Figure 2 - A network with five nodes and one with six nodes

In a star graph, or a hub network, only one node is in contact with all other nodes, making the number of connections: $c = n - 1$. Figure 3 shows two networks, with five and with six nodes respectively and therefore four and five connections.

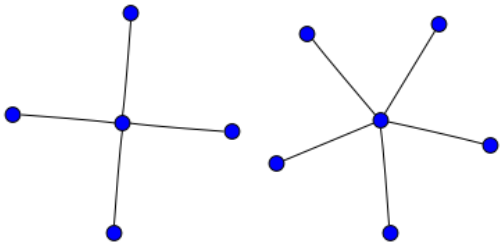

Figure 3 - Star graphs with five and six nodes

The hub network requires a hierarchy, where the central node is coordinating the information flow to the other nodes. This node has to be specified and equipped for this role, and there is a need for rules regarding how this role is performed, something that becomes more evident when adding more nodes to the network (Knuth, 1975).

3.2.2 Alignment of Interests

In all types of cooperation, it is of paramount importance that there are overlapping goals and interests that cooperation can be built on. The best-case scenario is, of course, completely overlapping interests where, if one of the participants is satisfied, so are the others. More often, there are partly overlapping goals and interests, so that the actors can agree on some shared sub interest. Let A denote the set of interests of one actor, and B the set of interests of another actor, then $A \cap B$ is the set of their shared sub interest, see Figure 4. Adding an additional actor, with set of interests C that gives the intersection $A \cap B \cap C$. In the case that interests and preferences are not identical between the actors, since $A \cap B \cap C \leq A \cap B \leq A$, more actors will result in a smaller "common ground".

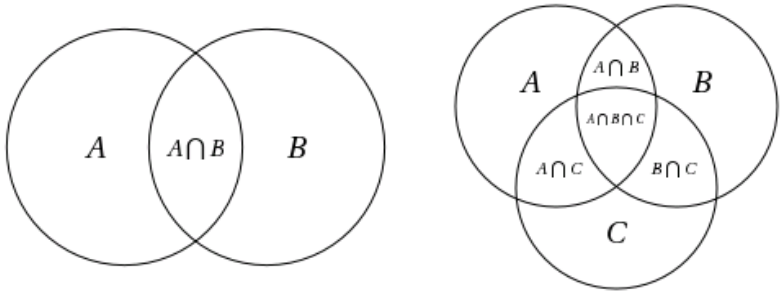

Figure 4 - Two and three sets with subsets

It can also be the case that one actor's interest is a subset of another actor's, as in Figure 5 below. That would allow for cooperation that fills the interests of *E,* while only satisfies part of the preferences of *D* who would need to look outside of the cooperation to satisfy the rest.

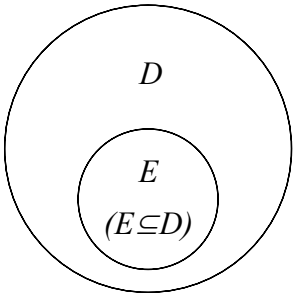

Figure 5 - One set as a subset of another set

Actors in cooperative negotiations with several parties are faced with the problem of cooperating to an extent that will make mutually beneficial agreements possible, while also competing enough to make sure their own interests are satisfied. With many parties involved, the probability of finding solutions that all parties are completely satisfied with decreases. However, if there are several different areas of interest under negotiation, the probability for finding some overlapping areas increases. This might only be possible by building coalitions within the larger group on a subset of the areas under negotiation (Polzer et al., 1998).

3.2.3 Transaction Cost Economics

One of the benefits of cooperation is inter-firm specialisation, where the cooperating firms focuses on what they are best at. In order to reap these benefits, relationship-specific investments need to be made. These are known as transaction costs and can be of four

different types. *Search costs,* which denote the costs of searching the market for and evaluating possible trading partners. *Contracting costs,* which include the costs of negotiating and writing a contract. *Monitoring costs* are the costs associated with making sure that the parties fulfil their obligations. *Enforcement costs* refer to costs for sanctions and bargaining after the contract, if some party has not performed according to its obligations (Dyer, 1997).

These are all costs that will increase the less commodity-like the good or service is. With a true commodity, a "complete contract" can be written, and with such a contract can disputes easily be solved in court or through arbitration. With a more specialized good or service, it becomes increasingly difficult and expensive to write a complete contract, and the parties must resort to an incomplete contract and to other types of safeguards for their interests. An incomplete contract will in turn increase the costs of monitoring and enforcement, and thus increase the transaction costs even more. At some point these costs reach a level where it is not feasible to make the transaction on the market, but instead vertically integrate the supplier to reduce the agency conflict (Williamson, 1981).

The level of transaction costs is also depending on the relationship between the transaction parties. If it is the first time two parties conduct business, chances are that both of them will take precautions in order to avoid opportunistic behaviour of the other. However, with a returning business partner, some level of trust can exist between the parties that can reduce the need for safeguards. It has been show that close business relationships with high relationship-specific investments still can have very low transaction costs. A company can also get a reputation as a "good business partner", whereas it might be sufficient to have second-hand experience of the business partner in order to decrease the transaction costs. Besides the lower transaction costs, if trust exist between the parties chances are that they will engage in value creation beyond the contract, due to a belief that these gains will be shared fairly (Dyer, 1997). This holds for private companies, which can base their procurement decisions on reputation, while public procurement rules demand the use of objective indicators. Thus, transaction costs are likely to be higher in public procurement than in private procurement (Holm, 2011)

3.3 Pricing in Public Procurement

In public procurement pricing, there are several different strategies that can be used. In a bidding situation, where all bidders can be assumed to fulfil the basic criteria, the one with the lowest price b will be selected. In a perfect market with infinitely many suppliers and a one-time closed bid auction, that price will equal the cost c of providing the good or service. If those conditions do not fully exist, which is the case for real markets, the price will differ.

In the case of a limited number of suppliers competing for a contract, there will be a best-response scenario, where the suppliers are trying to anticipate their competitors' bids, b_i, and place themselves just below. With better knowledge and possibility to affect the other suppliers behaviour, the higher and more equal the prices will be and the situation becomes a cartel.

The cost, c_i, of providing the good or service may also differ between the suppliers and might not be known beforehand, even for each supplier. Reasons for this can be fluctuations in commodity prices, increases in wages and technological uncertainties. In this case, all bidders will put the price above their expected cost and charge a premium for bearing the risks.

If the auction is not to be regarded as one-of-a-kind, i.e. that there is a possibility for returning business, another type of bidding behaviour can be encouraged. Winning the first round of auctions might put the winning company in a better position to win a second round. One example of this is when a private company has a monopoly on providing a public service for a limited time. The incumbent contractor has already made the necessary investments and has therefore a lower cost structure when it is time for the contract to be renewed. To achieve return on investment, the company expects to have the contract for two, or more, contract periods. This is, of course, a risky assumption, since another actor might do the same thing in the next call. For the buyer of the service, the situation prevents unreasonable pricing.

Two fundamentally different pricing strategies can be identified on this not-perfect market, namely *pricing to profit* and *pricing to win.* The former implies setting the highest price which still has a decent chance of winning the auction, making the expected value for the bidder and the function to maximize: $P(b) \times (b - c)$. The latter, *pricing to win,* is to set a low price to maximize the probability of winning the auction, while not losing too much money. This might be in order to get a "foot-in-the-door" on the buyer and make more money in a follow-up auction. (Milgrom, 1989)

3.4 Regulation of Quality in Public Procurement

Depending on the nature of the transaction, quality can sometimes be assessed *ex ante*, a *search good*. In other cases, quality can only be assessed *ex post*, an *experience good*. While incentives for a producer to supply high quality on search goods are to promote sales, incentives for experience goods are more long-term in the form of reputation. Reputation as a supplier of quality would increase the possibility of future sales and return-sales (Nelson, 1970).

Another distinction is made between *observable* and *verifiable* quality. The former is possible for the customer to assess before or after the purchase in a subjective way. The latter is also possible to objectively be described *ex ante* in a contract and assessed *ex post* by a court. (Hart & Moore, 1999)

Hence, in public procurement, where due to regulation it is only possible to base procurement decisions on objective grounds, the verifiable quality aspects will be the only ones of real importance (Laffont & Tirole, 1993).

3.5 Value of Intellectual Property Rights

Many different factors come into account when assessing the value of intellectual properties. Not only is the value only a potential one, the net present value of possible future income

during the time of excusive rights, which can turn out to be nothing if, for instance, some substituting product becomes available. There is also the cost and feasibility of enforcing the rights, if infringements are detected, which especially for smaller companies might be a cost too high to bear. One study even questions the value of patents for small companies all together, except when selling them (S. Macdonald, B. Lefang, 1998).

Selling the intellectual property is an important way to determine the value of it. Hence are restrictions on selling or transferring the intellectual property detrimental to its value, since there might be another actor better positioned to commercialize on the intellectual property. With full rights to the intellectual property, selling it will follow the free market rules while restrictions will reduce the number of possible buyers and also what they are willing to pay.

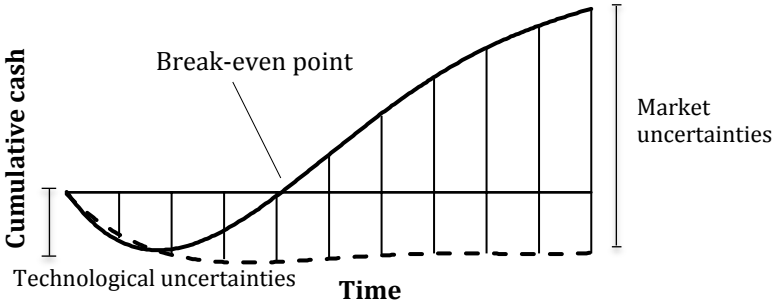

Figure 6 - Cashflow/time diagram

There are many different uncertainties to handle in management of innovation. The very nature of an innovation gives rise to technological uncertainties – it is not yet clear how the innovation is going to be realized. Hence, how difficult, time-consuming and costly, the depth of the curve in Figure 6, it will be to overcome the technical challenges varies. Small, incremental innovations might be easier to forecast than is disruptive technological leaps and can have a smaller negative cash flow before commercialisation. These types of innovations usually also carry a smaller potential profit, the right part of Figure 6. For a company to make a substantial investment into a high-risk project, the reward possible must be even more substantial. If it proves unfeasible to overcome the technological difficulties, or if the market responds unfavourable to what was projected, the break-even point might not be reached, as is the case for the dotted line in Figure 6. This is the standard case in high-technology innovation and point to the importance of intellectual property rights. Enough profits from a smaller number of innovative projects must be possible to capture to more than make up for losses from a higher number of failed projects (Andrew & Sirkin, 2007).

3.6 The European Defence Market – Just Another Market?

The market for defence equipment is not a free market. While other markets have opened up to competition, governments, the World Trade Organisation and the European Union have provided exceptions for the defence industry, indicating the special nature of the market. In some European countries, less than one per cent of the total value of military procurement was issued under international competition, meaning that billions of euros of business was conducted on a market with single buyers and an oligopoly of sellers (Dyson &

Konstadinides, 2013). It can even be argued that the defence industry has characteristics of a cartel, since the limited number of actors have very good knowledge about the others' organization and competences and are sometimes encouraged to cooperate. Together with the close ties to the buyers, the domestic importance of the industry puts it in a position to affect regulation of the market (Markusen, 2004). In the year 2007, article 296 of the Treaty of Amsterdam, excluding defence equipment from the common European market, was replaced with article 346 of the Treaty of Lisbon. Article 346 allows exceptions based on essential security interests, but not on economic interests where regional employment have commonly been factored in (Dyson & Konstadinides, 2013). This is one step towards a common European market for defence procurement based on competition, but there are still many governments calling on article 346 in order to keep and develop *"strategic competences"* in their countries (Financial Times May 19, 2013).

Most countries have built up their own defence industry as part of political manifestation of sovereignty. This is especially true for Sweden, being neutral during the Cold War. In Eastern Europe, former Warsaw Pact countries used to rely on Soviet made equipment and had, if any, a specialised defence industry, which was in many cases dismantled or disrupted after the Cold War. In Western Europe, despite the influence of Nato, a high degree of redundancy has been kept, often partly for employment purposes. Many countries rely on the United States as a supplier of high-tech equipment and components, while the bulk of the defence industry is nationally organised (Lundmark, 2011). This is because even high spending countries cannot match the capabilities of the United States in more than a few areas.

In a market with technologically advanced equipment, restrictions on trade and a very limited base of buyers, defence companies do not conduct much research and development work without buying orders or funding provided. With the more advanced systems, the product does usually not exist, other than in a concept stage, before there is a buyer. The market calls for long-term relationships between buyers and sellers. The buyer usually finances the development of the product and expects the seller to be present during the entire lifespan of the system for service, support and modifications, maybe up to 50 years (Lundmark, 2011).

3.6.1 Innovation in Defence Programmes

Since technological superiority is one of the key success factors for the armed forces of Europe, an innovative defence industry is of paramount importance. Keeping the industry innovative demands a supply of well-educated personnel, access to related civilian high technology and a stream of new orders of some volume and demanding technological level. One of the most important factors for innovation in defence programmes is an informed, active and demanding buyer pushing for excellence (von Hippel, 1988). Since new technology and innovations builds, to a large extent, on existing technology, access to that existing technology is needed in order to produce innovations. Access can be achieved through a well functioning intellectual property rights regime, where the transaction costs are acceptable, or through a pool of public knowledge that is free to use. Basic science research is usually publicly funded and the results are freely accessible to all, while more applied research is usually protected by intellectual property rights (Scotchmer, 1991).

3.6.2 The Technology Gap

With protected markets and separate defence industrial infrastructures, geopolitically separate defence industries have developed differently, with the civilian industry working as an important cross-pollinator. Between the United States and Europe, a greater discrepancy is building up, due to differences in investments. While the United States are spending just over 700 billion dollars annually on defence, the countries of the European Union are spending less than 300 billion dollars. What is more important for this argument is the even greater discrepancy in research and development spending, where the United States outspends Europe by a factor of six (Lundmark, 2011). While Europe might be getting a higher return on investment in some areas, they are also loosing efficiency by having redundant programmes and no coherent research strategy. These factors create a larger *technological gap,* thus making the European defence industry companies less attractive collaboration partners for their American counterparts (Gunnar Hult, 2013-02-27). Without a common body of technological knowledge, there might also be practical difficulties in working together. (Financial Times, 14 July 2008) Within Europe, a similar situation exists between the handful of Western European countries, responsible for 80 per cent of the defence spending and well above 90 per cent of defence research and development, and the less advanced countries, primarily in Eastern Europe (Lars Ajaxon, 2013-02-28). In 2010, France, Germany and the United Kingdom together accounted for about 94 per cent of the investments in defence research and development (EDA, 2013). During the time after World War II until approximately the 1970s, new technologies were often developed for military use and could have civilian spinoffs, developed later. The civilian market is now, in contrast to that time, driving the technological development within fields like electronics and information technology, and can in such areas function as bridges over the technological gap. Having the civilian technological competence act as common knowledge base can help collaboration between companies (Lorell et al. 2000).

3.7 Offset Arrangements

By tradition, cross-border arms deals have been accompanied by different offset arrangements, aiming to provide additional value to the arms deal for the buyer. This can be in the form of technology transfer, work share of unrelated investments or counter-trade. There are many different types of offsets; some of which will be described below (Henriksson & Hermansson, 2012). Many types of offsets are reducing transparency of arms deals and are regarded as market-distorting, since they skew competition. Indirect offsets are not allowed in EU law; they do however still exist in different forms and are more often called “industrial participation” instead (Directive 2009/81/EC; The Economist, May 25th 2013).

3.7.1 Juste Retour

In a *juste retour* arrangement, the full value of the deal is expected to return to the buying country, leaving the balance of trade unchanged. In a cooperative setting, this is often in the form of executing a part of the project equal to the country’s investment. Due to the ambition of making the shares equal, transaction costs increase as the collaboration becomes more

artificial. The end of the original contract usually completes any *juste retour* arrangements. (Lindgren et al., 2002)

3.7.2 Work Share

This is essentially the same as *just retour,* but with a focus on competency and less on the exact monetary return. It can range from just producing part of the equipment the country is buying, to becoming the supplier of that part to all customers. If there is a difference in technological skills, the buying country is often producing the low-tech components, thus often with a lower value. The value of the work share can be both below and above 100 per cent. (Lindgren et al., 2002)

3.7.3 Indirect Offsets

In high-value deals with low-tech buyers, indirect offsets are often used to make some return investment into the buying country. These investments can take many different forms, but the common criterion is to give the buyer some more tangible values than just the defence system bought and plays an important role in politically motivating the transaction domestically. This can be in the form of financing shrimp farms in Saudi Arabia, tourism promotion for South Africa (The Economist, May 25th 2013), placing a customer electronics facility in Hungary (Henriksson & Hermansson, 2012) or bringing Australian wine to the Swedish alcohol monopoly (Affärsvärlden, March 20th 2012,). Since these contracts usually are confidential, knowing the exact values of the indirect offsets is very difficult. However, they are often thought to be above 100 per cent of the contract and span over a long time, often even after the main contract is completed (Gunnar Hult, 2013-02-27).

4 Case study – Joint Investment Programme in Force Protection

This chapter is based on information received during the interview study, information from the proposals received and from the contracts from the eighteen projects in the programme. The chapter will start with an overview of the calls and thereafter describe some of the characteristics that differed between the proposals. The chapter will be of descriptive nature and does not contain any analysis of the information collected. Some relevant data and statistics are available in the appendixes.

4.1 Overview of the Calls for Proposals

Four calls for proposals were issued to the invited entities, with about six months intervals. Each call had a different topic based on earlier established research and technology goals that was to be covered in the projects, as well as an indicative budget frame. There was no fixed budget in each call, since flexibility on size, scope and number of projects was sought after. In calls two, three and four, improvement points were granted to entities from countries that had a no or low industrial return from earlier calls.

With each call, the list of potential contractors was attached, assembled by the different national representatives. Only entities competent in the technical areas to be covered were allowed to take part. One important purpose of the list was to give entities in different parts of Europe an easy way to get in contact with each other. In reality, according to several interviewees, all companies that wanted to be on the list were allowed and there was no selective screening at that stage, since the national representatives did not want to be accused for unfair competition. Also, since there was some degree of national competition, the national representatives did not want to leave out one of "their" potential contractors.

4.1.1 First Call for Proposals

The first call, which was issued in June 2007, was focusing on the topic of *"Collective Survivability"*. 270 entities were on the distributed list of potential contractors and the indicative budget was 15 million euros provided by the participating member states. Co-funding of up to 50 per cent by the consortia was allowed, however, there was no lower limit as to how much co-funding to provide.

Since no country had any industrial return at this point, no improvement points were used in this call.

4.1.2 Second Call for Proposals

The second call, issued in November 2007, was again covering *"Collective Survivability"*, but also *"Individual Protection"* and *"Secured Tactical Wireless Communication Systems in the Urban Environment"*. The indicative budget of this call was 14 million euros and 306 entities were on the potential contractors list. This time, the allowed level of co-funding was between 20 and 50 per cent.

Improvement points were granted if a consortium included an entity nominated by the Czech Republic, Estonia, Finland, Greece, Hungary, Ireland, the Netherlands, Poland, or Slovakia, and double that if it included two or more.

4.1.3 Third Call for Proposals

The third call, from May 2008, covered *"Data Analysis, including Data Fusion from various Sources",* with an indicative budget of 15 million euros. 155 entities were on the list of potential contractors. Co-funding of between 20 and 50 per cent was allowed, as in the previous call.

In this call, improvement was granted if Belgium, the Czech Republic, Estonia, Greece, Hungary, Ireland, the Netherlands, Norway, Poland, or Slovakia had at least one entity in the consortia. Double improvement was awarded if also the Czech Republic, Estonia, Greece, Hungary, Ireland, or Slovakia was present. There was also a rule aiming to reduce improvement in the case of participation by entities nominated by Italy or Portugal. However, due to its formulation in this call, the rule carried little practical effect.

4.1.4 Fourth Call for Proposals

The forth and last call on the topics of "Mission Planning / Training in an asymmetric environment" and *"Secured tactical wireless communications"* was released in December 2008. The indicative budget was 14 million euros and 221 entities were invited. Co-funding of between 20 and 50 per cent was allowed, as in the two previous calls.

Improvement was granted if there were at least one entity nominated by Estonia, Norway, Poland or Slovakia is present in the consortium. Double improvement was given for two entities from these countries, of which at least one entity had been nominated by Estonia or Slovakia. Additional improvement was given if work packages of at least 500 000 euros were allocated to Poland. A maximum of six points, or ten per cent of the total score, improvement could be achieved by these rules. Improvement was restricted if the Czech Republic, Hungary, Ireland, Portugal, Spain or Sweden were present in the consortia. No improvement at all was given if an Italian entity was in the consortium.

4.2 Overview of the Proposals

A total of 73 different proposals were received in the four calls. They were given points with different weight in different categories according to an evaluation template and then rated based on the total score, as seen in Appendix 2. There were thresholds in the different categories as well as a total threshold that needed to be achieved in order for the proposal to be considered. Out of the 73 received proposals, 72 were received in time to be evaluated, 42 were at or above the threshold, 21 got recommended for funding and eighteen were finally selected. In none of the calls were there any difficulties in finding suitable projects to fund.

4.2.1 Proposals in the First Call

In the first call, a total of 30 proposals were received. Of them, fifteen passed the threshold level in the evaluation. The received proposals had a combined value of about 83 million euros. Six of the proposals were recommended for funding from the programme budget. The six requested funding of 18 million euros, three million more than the budget frame. Therefore only five of the proposals were selected for funding. The sixth one was actively invited to take part in Call 2, in order to give it another chance.

4.2.2 Proposals in the Second Call

This call only received fourteen proposals, even though the scope of the call was wider than in the previous call. Several interviewees at the European Defence Agency believed that the lower number of proposals had to do with a better understanding of the effort to prepare good proposals as well as being better at finding consortia partners. Another identified reason for the popularity of the first call was the initial promotion of the programme by the national representatives. As mentioned above, this was the call with the highest number of potential contractors on the list. Six of the fourteen proposals were above the threshold and three were finally selected for funding. One of them had a request for funding of over nine million euros; consequently the budget frame was more than filled with the recommended proposals. The actual contract awarded was funded to almost eight million euros, since there were overlaps with an existing project. Of the recommended proposals, one received full improvement and the others received the lower improvement.

Three proposals from the first call were re-submitted for the second call, with some changes and additions in the consortia and with increased co-financing. One of these proposals was selected in Call 2, and it was also the only one of these proposals that had significantly improved its score. Consortia size increased in general after the first call, as will be described in more detail below.

4.2.3 Proposals in the Third Call

In the third call, fifteen proposals were received. Of them, fourteen were received on time, ten passed all the thresholds and six were recommended for funding. The fourteen evaluated proposals requested 38 million euros in funding, while the six recommended ones requested about 17 million euros. In order to secure the financing of the last call of the programme, only the five top-ranking proposals received funding.

All but two of the recommended proposals had received full improvement of four points.

4.2.4 Proposals in the Fourth Call

In the fourth and final call, fifteen proposals were received. Of them, eleven passed the thresholds and six were recommended for funding. With a limited remaining budget in the programme, only five were selected. One of the selected proposals had a lower score than another one that was not selected, due to the redundancy created otherwise. There were no clear rules on how to act in this type of situation and the final decision was taken by the Management Committee.

Of the eleven recommended proposals, all but three had received the full six improvement points. No Italian entities were in any of the selected proposals, for the first time in the programme.

4.3 Level of Co-financing

Since different intellectual property rights applied depending on if the project was fully funded or partly funded by the programme, most consortia opted for the co-financing alternative. Of the proposals received, seven offered no co-financing at all and out of the eighteen selected proposals, only one was fully funded by the Programme. The other seventeen projects were co-funded with between 15 and 50 per cent of the budget, with an average of 26 per cent from the consortia. One representative from a larger company explained their chosen level of co-financing.

"We wanted to co-finance, partly to show that we were serious about the project [and also] *because of the* [intellectual property] *rules. Contributing with the minimum stated amount seemed a bit 'cheap' and contributing with much more would make us lose money on the project."*

The representative continued:

"We did not expect to make money on the project, but hoped it would open future business opportunities."

The consortia leaders led the discussions regarding co-funding in the consortia. They often had both higher value work packages and higher relative co-financing at about 31 per cent. This gave them, in addition to their formal leadership, a position to demand co-financing from the other consortia members. Nevertheless, there were big differences in how coherent the level of co-financing was within the consortia. While four of the consortia choose to have the same level of co-financing for all its members, others were more differentiated with members without any co-financing and one example of a member with 100 per cent co-financing. The different levels called for intra-consortia agreements regarding work-share and intellectual property rules. In several consortia, academic institutions and laboratories had lower levels of co-financing, something that was motivated by their often restricted budgets and possibilities to commercialize their work.

4.4 Members in the Consortia

To be allowed in the programme, consortia needed to consist of at least two member entities from different countries. Moreover, at least one of the members in the consortia needed to be an SME, an academic institution or a non-governmental laboratory.

While in the proposals for the first call the average consortia consisted of 5.3 entities, the number of entities increased for the following calls to 7.7 in call two, 7.1 in call three and 6.1

in call four. "*It was no secret,"* said one interviewee, "*that some consortia members were added with the sole purpose of maximizing the bonus."* Several interviewees was under the impression that most consortia probably were too large, while adding that the project management of the consortia leader was the most important factor for successful consortia, regardless of size.

4.4.1 Constructing Consortia

Several of the interviewees have stated that the consortium constructions were a bit arbitrary, with limited research on the possible partner companies conducted. Three separate main ways of constructing consortia has been identified in the interviews.

One larger company, often a systems integrator, contacts a few other companies; some smaller and some larger, about whom they have some knowledge, either about personnel or about competences. After that, some type of gap analysis is being performed in order to see what competences and capabilities that needs to be added and whether the geographic spread should be improved. Here the list of potential contractors has been used and the addition of new consortia members has been described as a bit of a gamble. One interviewee stated about one of these wildcards:

"We had absolutely no idea what to expect, so we were really positively surprised when the work package was excellently performed."

Another interviewee agreed:

"Our consortia had redundancy in case the less known members couldn't deliver what they promised."

Another way of constructing consortia was when a group of smaller companies and academic institutions had most of the technical competences needed, but needed administrative support and project management that larger companies could provide. *"We were contacted just a few days before the proposal deadline with a request by a group of smaller companies asking us to lead their consortia",* said one representative from a non-participating company.

The third way was when a smaller company or a non-governmental laboratory was the lead entity while consortia members could also be larger systems integrators. Three consortia of this type were selected for funding, while several more submitted proposals. There were some worries expressed by the evaluators with regards to the project management capabilities and the resources of the smaller sized companies to handle the lead role of the projects. However, there is no significant difference in evaluation results between the smaller entities and the larger ones.

4.5 Evaluation

Evaluation Panels led by a non-voting chairman from the European Defence Agency performed the evaluation of the proposals. Each Management Committee member supplied a

list of national experts in the fields the call related to, and those lists were merged into one. All members of the Evaluation Panel started by evaluating their assigned proposals by themselves and filled in an Individual Assessment Report. Afterwards, they met with the other evaluators to fill in a Consensus Report, where a mutual view of the proposal was expressed. The chairman led the discussions and worked to ensure the comparability between proposals. However, there were still some concerns, expressed by one interviewee, about differences in scoring between evaluators. Most of the differences, according to several interviewees, were between the calls and had no effect on which proposals were selected.

Each proposal was evaluated by at least five experts from different countries, to avoid nationality bias. France, Germany and Poland, the countries with the highest share of the budget, were always represented in the groups of evaluators. Two different interviewees stated that there might have been some tendencies by specific evaluators to favour their national contractors, but that the end results were still fair and professionally evaluated.

The evaluation guidelines used were attached in the calls to the potential contractors. As they were fairly detailed as to how the evaluations were being conducted, most of the proposals were detailed in describing how they would fulfil the demands in the calls. All interviewees with experience from the evaluations agreed that all the good proposals had paid attention to what was being evaluated and formulated their proposals accordingly.

4.6 Quality of Proposals

During the evaluations, the two most important criteria evaluated were the ones relating to the technical quality of the proposals. These were *"Capability improvement"* and *"Research and Technology excellence"*. One factor of importance to receive the higher scores for the second criteria was that no unnecessary duplication of past or on-going work was included in the proposal. In addition, the consortia had to demonstrate a thorough understanding of the technological state-of-the-art and describe how their proposal exceeds it. It was also possible to demonstrate a more innovative research approach on a less innovative technological solution.

For *"Capability improvement"* the demands were to show how the proposal in a tangible way would close the expressed capability gap. One sub-criterion was the extent of the capability improvement. Both understanding of the capability gap and a realisable solution was needed. Since the goal was not a deployable product, the proposal also needed to state how the solution could go into application in the future and what further development work that would be needed.

According to the interviewees involved in the evaluation process, most of proposals above the thresholds had no problems with the state-of-the-art requisite. According to one interviewee:

"We were happy with the technical quality, most proposals were good and some were well above expectations. Almost all that were picked were very good."

4.6.1 Delivery of Results

Representatives from a non-participating entity expressed concern that the intellectual property arrangement was so unfavourable for the companies that they might *"keep their 'golden eggs' to themselves"* in the projects. Companies might come up with research results that are kept secret and not delivered. This would be to commercialise project results at a later stage in order to receive unrestricted rights to the findings. None of the other interviewees had seen any indications of that sort, but agreed that it would have been difficult to detect. One interviewee said, *"if it's not in the proposal, they might not be selected – if it's not in the deliverables, they might not be paid",* adding that it might not be that simple in research work. The programme manager, partly responsible for the conditions, agreed that several of the larger companies had preferred other terms but that it was mostly due to novel conditions. One of the participating companies had at first opted out, due to intellectual property concerns, but was later persuaded by the national representative to take part.

4.7 Global Balance

After each evaluation process, a calculation of the current state of global balance was performed. This was not used as a fixed factor in the evaluation, but rather to design improvement rules for the following call. Only in the last call two different alternatives were presented before the Management Committee in awarding contracts, with corresponding differences in global balance. How the industrial return was accumulated over the course of the programme is described in Table 2. In each column is stated what the share of each country's contribution to the programme budget was returned to that country's participating entities after each call. In the first column, eight of the countries had zero per cent industrial return and they, together with Poland, were the ones that awarded improvement for the following call. From the table, it can also be seen that Estonia and Slovakia still had no industrial return after the third call, while Italy had 181 per cent, explaining the design of the improvements added in the last call. The figures in the last column show the final state of industrial return at the end of the programme. All countries except Cyprus had some level of industrial return.

	After Call 1	After Call 2	After Call 3	After Call 4
AT – Austria	62 %	62 %	62 %	92 %
BE – Belgium	24 %	24 %	77 %	81 %
CY – Cyprus	0 %	0 %	0 %	0 %
CZ - Czech Republic	0 %	0 %	112 %	112 %
DE – Germany	23 %	62 %	84 %	92 %
EE – Estonia	0 %	0 %	0 %	80 %
EL – Greece	0 %	0 %	94 %	104 %
ES – Spain	24 %	85 %	129 %	129 %
FI – Finland	12 %	38 %	59 %	69 %
FR – France	43 %	61 %	70 %	97 %

HU – Hungary	0 %	0 %	104 %	104 %
IE – Ireland	0 %	0 %	107 %	107 %
IT – Italy	45 %	102 %	181 %	181 %
NL - the Netherlands	0 %	19 %	70 %	146 %
NO – Norway	23 %	23 %	23 %	77 %
PL – Poland	5 %	21 %	38 %	74 %
PT – Portugal	27 %	124 %	124 %	124 %
SE – Sweden	23 %	63 %	121 %	131 %
SI – Slovenia	62 %	62 %	62 %	99 %
SK – Slovakia	0 %	0 %	0 %	74 %

Table 2 - Development of industrial return

5 Analysis

In this chapter, the analysis of the study will be presented. The empirical findings from the case study have been analysed using the theoretical findings from the literature.

While some of the effects of the contractual conditions and the evaluation guidelines are easy to identify, others are more difficult to assess. It is clear that some actors participated without having a full comprehension of the programme, but rather to not miss out on an opportunity for business.

5.1 Implications of Novel Programme

All of the respondents, as well as indications from the quantitative analysis, point to the fact that this was a new type of programme. While the non-participants were unsure whether the programme arrangement would be beneficial for them, participating companies and agency representatives noted the high degree of ambition, pragmatism and willingness to succeed. Many participants hoped that the programme would be a stepping-stone towards bigger projects, and where thus willing to *"go that extra mile"*. It is also apparent that the consortia forming and bidding was more efficient after the first call for proposals. Fewer proposals were received after the first call, something that can be attributed to the learning process, with companies becoming better to organize in consortia as well as to a realization of the effort for proposal making. This is further supported by the higher number of consortia members in later calls.

5.2 The Mechanism of Co-financing

In the first call, there was no lower limit on the amount of co-financing, and the received proposals varied between 5 and 50 per cent in co-financing, of the ones that had co-financing. After that, a lower limit of 20 per cent was enforced to make co-financing a clearer commitment. The first call showed that 20 per cent was a figure most of the consortia could accept as a limit, but some participated with more even after that. This indicates a "tune-in" necessary for the participating actors. There were also differences in the level of activity of national government representatives in promoting the programme for their respective industry.

Several of the interviewees saw co-financing as a way to communicate a belief in a project, as well as a way to actually make sure that the project got enough resources to fulfil its goals. It was also in order to get better intellectual property rights. In relation to the "foot-in-the-door"-theory, contributing with more co-financing now in order to commercialize in later steps makes good business sense. This also explains the pricing, where participating entities were ready to accept break-even funding and maybe less, if there was a chance to make a profit later.

5.2.1 Can Co-financing Be Used As an Indicator of Quality?

It is interesting to note that there was only a small difference in the mean value of co-financing between the proposals with the highest proxy quality and those of lower quality.

The high quality proposals had a mean co-financing of 22.4 per cent, and a median of 21.2 per cent, while the lower quality proposals had a mean of 20.2 and a median of 14 per cent. What differs more is the standard deviation, with 8.9 for the higher quality proposals and at least[3] 14.2 for the lower ones. This means that while the top proposals were fairly centred around 25 per cent co-funding with a few outliers – one without co-funding, the poorer proposals were much less coherent – four without co-funding and three with 50 per cent. The second-degree regression line in Figure 7 shows that there is correlation between the quality and the co-financing of the proposals and further shows the concentrations of the scores. The proposals that were selected had an even higher level of co-financing, 26 per cent, something that can be attributed to their higher score in the category "Value for money".

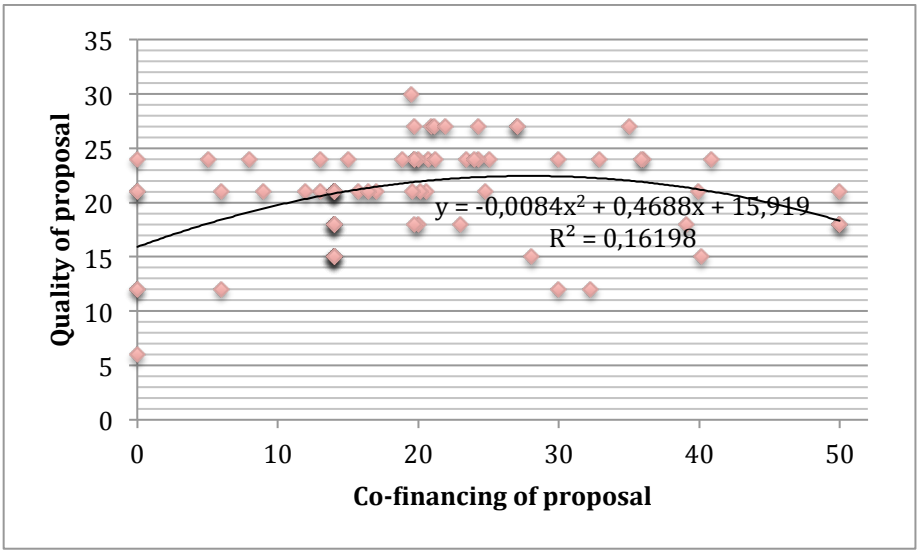

Figure 7 - Quality of proposals and co-financing

Using co-financing as an indicator of quality would not be feasible for two reasons. First, if the call for proposals stated that co-financing would be a measurement, it would turn the programme into a reversed auction. Secondly, looking at one single project does not tell whether that is just one of the poor projects that happened to have a good level of co-financing. Good proposals were generally co-financed, but all co-financed proposals were not good, as clearly is seen in Figure 7.

5.2.2 Co-financing By "Bonus Countries"

While the average level of co-financing of the selected proposals was 26 per cent, there were differences within the consortia. Entities from the bonus-giving countries only contributed with an average co-financing of nineteen per cent, resulting in a significant difference. One possibility was that the bonus-giving countries had a relatively large share of small and medium-sized enterprises as well as universities and research institutes participating. Since these types of entities often are more restricted in their spending, this could explain part of the phenomenon. However, as Figure 8 shows, there is lower co-funding from the bonus-giving countries even when that difference is taken into account.

[3] The exact levels of co-financing for the first call's non-selected proposals were unavailable. Therefore, mean values have been used, thus presenting the lowest possible standard deviation. This does not affect the argument.

Bonus-giving country?	Type of entity: Other	All	SME/ACA
Yes	8 ent. 28,20 %	38 ent. 19,00 %	30 ent. 15,90 %
All	57 ent. 30,90 %	125 ent. 26,00 %	68 ent. 19,70 %
No	49 ent. 31,30 %	87 ent. 28,50 %	38 ent. 22,70 %

Figure 8 - Differences in co-funding depending on characteristics

5.3 The Mechanism of Global Balance

The global balance mechanism in the programme was very effective, with regards to the incentive scheme with bonus points, which was used close to its full extent. All of the selected proposals had responded to the bonus scheme and all but three got the maximum bonus score. Out of all the 43 received proposals in calls 2 to 4, only four were ineligible for any bonus. In the last call, where the participation of Italy cancelled any bonus for the consortia, only one consortium had Italian presence, further demonstrating the effectiveness of the scheme. This is to be compared with the almost fourteen Italian entities in each of the earlier calls. Also to note is that no entities from Cyprus were awarded any work packages, since the programme did not demand any such participation and there were no incentives to include such an entity.

However, a true global balance, or *juste retour,* was not achieved, as evident in Table 2. While for example Italy got 181 per cent in industrial return, Finland had only gotten 69 per cent when the programme was over. Without the global balance mechanism, these differences would probably be even bigger. A more restrictive global balance mechanism could, while ensuring a more even industrial return, also disqualify some of the best actors from participating and, hence, have a deteriorating effect on the quality of the proposals. The different counties have different defence industrial bases and would perform very differently on a free competitive market. Securing each participating country's industrial return to 100 per cent would remove many of the benefits of competition and make to programme less interesting for the dominant players, as well as increasing the transaction costs in the projects. The reason for the global balance mechanism in the programme was to get away from the tradition of *juste retour,* which was often needed to get the less established countries to participate. Global balance would be a sort of *work share* arrangement, but spread over several projects in different calls and hence allow more organic competition. It was only for Poland there was a certain amount allocated to polish entities needed to receive the full improvement.

5.3.1 The Technological Gap

Since some entities were, more or less, forced in to the consortia due to the importance of receiving the improvement points, the *technological gap* between different parts of Europe

became evident. More advanced industries had to delegate tasks to their "bonus members" which they in most of the cases would have been able to perform themselves or with existing partners. They also had to be prepared in case the new partner was unable to perform its task, and hence had some degree of redundancy in competency. In these cases, there was no mutual attraction or dependence between the participants, other than because of the programme arrangement.

5.3.2 Number of Entities in Consortia

The mechanism of global balance incentivised the consortia leader to add more entities to their consortia. Both the interview study and the quantitative analysis point to the presence of "extra members" in the later calls. Since the complexity of cooperation as well as transaction costs can increase with a higher number of participants, this can be negative for the quality of the projects and increase overhead costs. While transaction costs are generally increased with the number of participants, cooperating with unknown partners can further increase them. The knowledge of supplier reputation on new markets will be limited. This points to higher-than-necessary transaction costs for the consortia. Increasing the number of participants can also be beneficial for quality and innovation, if all the members in the consortia are utilized to their full potential. None of the interviewees reported entities without tasks, or with superfluous tasks. However, several described redundancy in competences, implying that most projects could have been performed adequately with fewer members, adding that additional members increased complexity in the consortia.

There was also a large variance among the projects with between three and seventeen members per consortia. This implies large differences in how the consortia leaders managed their members. Determined using linear regression analysis, the correlation between quality of proposals and number of entities is found to be very low, $R^2 = 0.05$, and cannot be used to draw any conclusions on the population, see Figure 9. Assuming a non-linear relationship, the value of R^2 increases slightly with a second-degree polynomial to 0.065, but not enough to establish any useful relationship of an optimal number of entities.

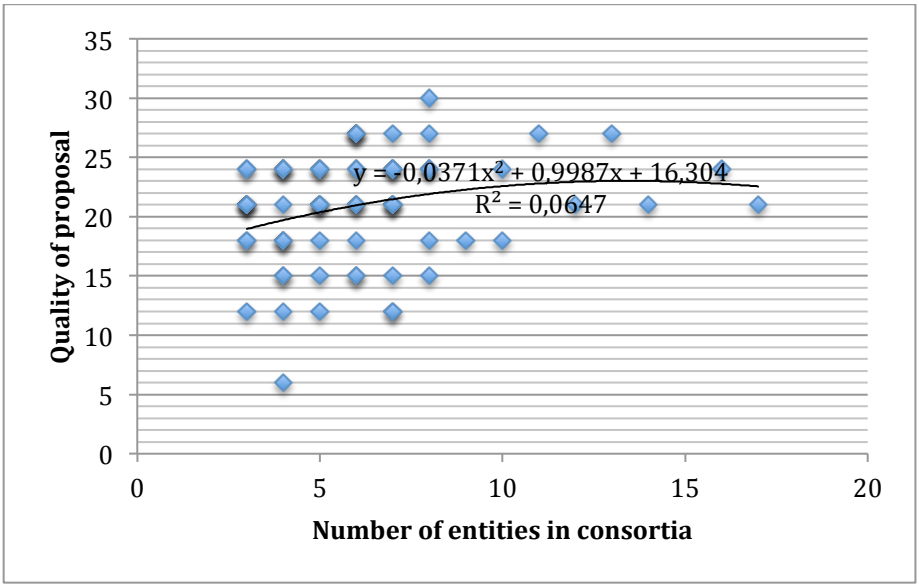

Figure 9 - Quality of proposals and number of entities in consortia

5.4 Contributing Member States

There was a high number of contributing member states in the programme, higher than several stakeholders would have preferred. The number of contributing member states had several implication, especially combined with the differences in maturity of the respective defence industries. There was no minimal contribution needed, other than the one per cent of the budget that was required to be guaranteed at least one work package in the programme.

5.4.1 Size of Programme Budget

First, more countries makes a larger programme budget possible, something that makes it possible to finance a higher number and more ambitious projects. The effect is diminishing, since a few countries provided the lion's share of the programme budget. Reducing the number of participating countries to half would only reduce the budget size with thirteen per cent. See Figure 10. A larger budget also attracts market appetite, with more companies finding it worthwhile to submit proposals.

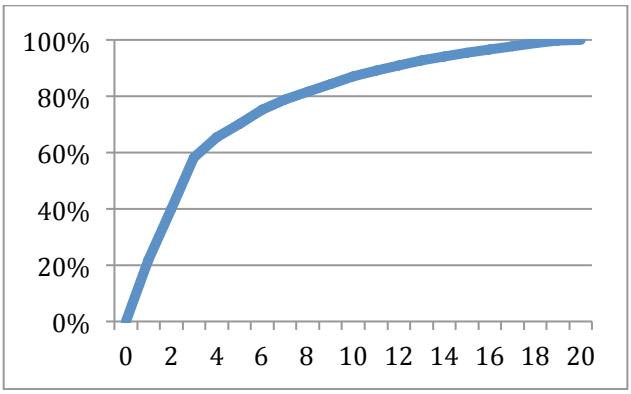

Figure 10 - Cumulative budget size and number of countries

5.4.2 Size of Market

Additionally, more countries means a larger market, with more companies competing, as well as more possible customers. Complementing competences makes it possible for consortia to take on tasks they would have difficulties with managing alone. However, also this is a diminishing marginal effect with each new member country. While collaboration between two or three of the prominent defence industry nations opens a wide technological base, further additions have only minor effects. Figure 11 shows the cumulative number of invited entities from each member country, sorted in falling order.

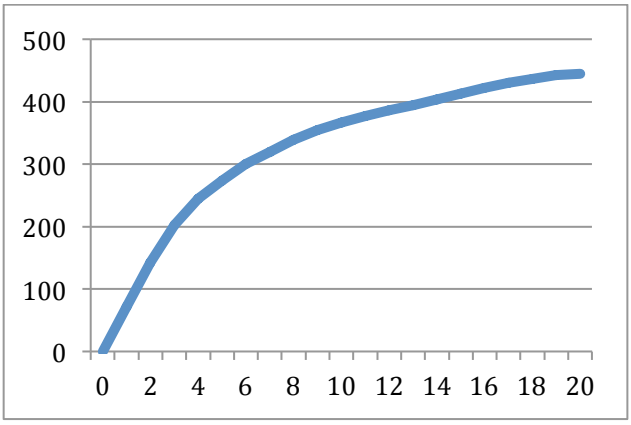

Figure 11 - Market size and number of countries

While a bigger market makes it possible to find a more competent supplier, the complexity and the costs of the search are increased. These transaction costs can be kept low by the market knowledge provided by the national defence procurement agencies, but are still increased with the number of participating countries.

5.4.3 Users of Results

Also, more countries also mean more "free-riders" of the project results, possibly a smaller market to sell results on and therefore a lower value on the intellectual property rights for the originators of those results. However, the nature of the results is of very little practical use for the defence purposes of the respective countries. Further development is needed and in such development work, the originators of the results would have a head start and possibly a better network to commercialise their work with. It is also possible that the countries participating in the programme would be more interested in buying a product in which development they have been part of since the beginning.

5.4.4 Administration and Coordination Problems

More partners in a cooperative arrangement can reduce the chance of efficient decision making and consensus-reaching. However, there were only a few problems stemming from the high number of participating member states, even though many programme decisions were taken in consensus. Compromises could be reached since none of the nations had any absolute operational requirements on the programme outcome, something that often makes international cooperation more difficult. A higher profile programme might have had more such problems.

Looking at the network theory of interactions, the European Defence Agency played an important role as coordinator of the programme. A programme without such an actor would have $\frac{20\cdot(20-1)}{2} = 190$ different interactions to manage for consensus reaching. Having just one contract partner in relation to the consortia also saves a lot of time. Conducting such programmes in a pre-organised manner rather than ad-hoc can therefore be of value.

Further problems can arise from the different parliamentary processes in different countries. Participation in international forum and funding for cooperative ventures can be changed over

time with different governments. This makes a programme with twenty participants and running over several years a complex operation that needs a competent actor as coordinator and holder of safeguards to ensure programme success despite national frictions.

5.4.5 Differences in National Defence Needs

The twenty participating member states had made a combined list of capability needs for their armed forces. Since the needs of the countries were not completely overlapping, the combined list did not fulfil any of the countries full demands. In order to give the participating consortia freedom of innovation, their task was to close the described capability gaps, instead of presenting a specified technical solution. The proposed solution was developed without interference from the buyers.

Every project had an Executive Management Group responsible for the performance of the project; however, it was not the *informed, active and demanding* buyer that is often needed for an innovative defence project. Since no country could push for its defined needs, there is a risk that the deliverables were compromises that all countries could accept, but that no one really needed. The high number of participating countries can therefore be seen as unfavourable for the creation of sought-after innovations and solutions.

5.5 A Simulation of the Awarding of Contracts Based on Quality

The simulations conducted did not, as expected, provide any revolutionary results. They did, however point to and strengthening findings from the qualitative analysis. More data is available in Appendix 3.

5.5.1 Base Selection Only on Total Score

All the proposals have been ranked based on total score in one single call and selected to fill the budget of 55 million euros. This shows the ranking without the influence of improvement but does not change the final ranking very much. The only changes are that two proposals from the last call would have been funded instead of two from the second and third call. One of them was not selected due to redundancy, as described above. The other would not certainly have been selected in the fourth call, had there been funding available, since that would create another capability overlap.

5.5.2 Selection Based on Quality

Using the proxy variable for quality, scores for *"Capability improvement"* and "*Research and technology excellence"*, the proposals with the highest quality have been identified. One of the proposals achieved full scores in both categories and is thus seen as the proposal with the highest quality. Eight proposals had full score, fifteen points, in one of the categories and twelve points, the second highest score, in the other. All of these proposals were selected and funded with a total of 31 million euros.

There were twenty proposals with twelve points in both of the examined categories, with a total request for funding of 59 million euros, overshooting the programme budget with 35

million euros. Selecting the ones that offer highest quality in relation to price made it possible to select a larger number of projects.

Only one of the selected proposal had lower “quality scores” than twelve and was selected due to its high scores in other categories. It is therefore the only proposal that for certain would not be selected in a quality-centred evaluation.

6 Conclusion

In this chapter, the conclusions of the thesis will be presented. The findings will be presented and discussed before some more overarching conclusions are drawn to answer the research questions. Some implications beyond the scope of the research questions are also discussed.

Different mechanisms in the evaluation guidelines and in the programme arrangement gave rise to different effects on the quality of the selected proposals in the programme. One factor of great importance was that this was a new type of programme, something that created some scepticism, but more importantly, a high level of ambition and pragmatism among the participating companies, which improved the quality of the proposals. It should be noted that this was because of widespread expectations of possible continuations for successful projects, and can therefore not be assigned to the characteristics of the programme.

The intellectual property rules, the mechanism of global balance, the low level of required member nation funding and the political pressure of a new program all worked towards a high number of participating member states. While many participating member states were beneficial in ensuring a large combined budget and pool of potential suppliers, it also reduced the possibilities of agreeing on needs and requirements. Even though compromises could be reached, all participating countries had to make some concessions as well as accept some superfluous capability needs in order to find a consensus. More participating member states also led to higher transaction costs due to increased market size, more negotiation and contracting work, participation in workgroups and the risk of individual nations changing their participation. Some of these costs are not taken from the programme budget, but are covered by the individual nation. Still, they are costs taken from the countries' potential participation. If the only objective for the programme would be to maximize the quality for money of the projects, fewer member states would have been preferable. Keeping the five countries that had entities acting as consortia leaders would have meant a more efficiently managed programme, still with a fairly large budget; 57 per cent of the actual one. Adding the United Kingdom to the programme would be beneficial for the output quality because of its budget size as well as its advanced defence industry. Additional members, willing to contribute with a substantial part of the budget, but without too many specific demands would also be welcome.

The evaluation groups rating of '*cooperation*', the mechanism of global balance and the requirement of including small or medium sized enterprises and academic institutions inflated the consortia sizes, especially of the selected proposals. More members in the consortia increased the possibilities for specialisation within consortia. Also, the high number of participating member states and the use of bonus points increased the geographical spread of the projects. This had positive effects on the integration of the European defence market, which is outside of the scope of this thesis, and on the possibilities of innovation in the consortia, which directly influences the quality of the proposals. However, due to the concentration of the European defence technological base, this effect was diminishing. At the same time, adding more consortia members increases transaction costs and coordination

problems. These costs and problems are generally bigger when the market is less well known, as is the case when new countries are added. It should be noted that as the companies increase their knowledge of previously unknown actors and new markets, transaction costs between them could decrease.

The intellectual property rules, including the mechanism of co-funding, gave the programme more value for the national investments by incentivising the participating companies to use their profit margins to further fund the projects. This was therefore a positive effect on the quality of the selected proposals. However, some companies might have been reluctant to participate and could possibly have withheld some research results because of intellectual property rights that they perceived to be unfavourable, which would have limited competition and reduced the quality of the proposals. Responding to these worries, while simultaneously increasing the incentives for co-funding would further have increased the quality of proposals in the programme. For a future project, it might be of interest to increase the incentives for co-financing. Most companies are prepared to use their own funds for research and technology projects that they believe in. One idea is to connect the applicable intellectual property rights to the level of co-financing in one additional step, with more generous right for a higher threshold of co-financing, perhaps somewhere between 20 and 50 per cent. That would also dismiss the argument of unfavourable intellectual property rules in the programme, since it would be up to the companies to decide what rules they were willing to pay for and what they believed their projects would be worth.

Even if the some of the rules regarding compulsory cooperation might have been negative for the quality of the programme at hand, future cooperative efforts will benefit from lessons learned and from the networks established.

6.1 Answering the Research Questions

The first research question was concerned with the quality of the selected proposals of the entire programme:

> ”*How was the quality of the selected proposals affected by the contractual arrangements and the evaluation guidelines in the programme?”*

Two processes were examined; whether the best of the received proposals were selected and what quality was encouraged in the programme. The simulation in the study gave at hand that the best quality proposals were generally selected. This was since most of the consortia that provided high quality proposals also took steps to ensure high scores in the total evaluation, as well as to receive possible bonus points. Only one of the selected proposals would have for sure been dismissed in a quality-centric selection.

The quality encouraged in the programme has been discussed above, but is difficult to quantify. While the basic layout with international cooperation gave the participating countries access to technology and capabilities that they might not have invested in by themselves, the evidence point to some mechanisms that were detrimental to the quality of the

proposal received. Most of the benefits of cooperation could have been achieved with both smaller consortia and fewer participating member states. Such a programme would have had the advantages of lower transaction costs, better alignment of interests and the possibility of higher levels of co-funding. Higher levels of co-funding could also be encouraged by a corresponding additional level of intellectual property rights, something that would also invite more companies to participate.

The second research question was focused on the Swedish participation, and has both been touching on the type of country Sweden is as well the empirical findings from the case study. Two main actors were affected in different ways; the Swedish defence industry and the Swedish governmental participation. The first actor's interests are profits, innovation and future sales. The second actor, the government, is partly interested in the success of the former, but is also interested in obtaining defence capabilities, or high quality projects, per invested tax euro as well as in the progress of European cooperation in general. The second research question was:

> *"What were the effects of the contractual arrangements and the evaluation guidelines in the programme for the Swedish participation?"*

Economically, Sweden, or its balance of trade, benefitted from its participation in the programme. While investing €1.49 million, the industrial return ended at €1.95 million, 131 per cent. Hence, this mechanism was more beneficial for Sweden than would be the case with a *juste retour*-based programme. However, the *global balance* mechanism reduced the bonus in the last call for consortia with Swedish entities in them, why the industrial return might have been even higher without that mechanism. However, it is reasonable to assume that several of the countries that had less than 100 per cent industrial return would have been reluctant to participate without such a mechanism, why, since this is a zero-sum game, a programme without these members would be less economically beneficial for Sweden.

As a country with a shrinking defence budget but a significant defence industry, international cooperation is a way for Sweden of ensuring industry innovation and competence while also increasing the industry's possibilities of finding reference customers outside the home market. The high number of participating countries can therefore be seen as beneficial for the Swedish industrial participants. The consortia size, however, was larger than optimal from the industrial participants point of view. Swedish entities would still have been welcome in smaller consortia, meaning less transaction costs and bigger work packages for the remaining members.

As a final conclusion, improving the programme from a quality-centric perspective would include other actions that what would improve the gains for the Swedish participation. For the gain of all participants would be some form of continuation of the programme, to commercialize the results. That would actually close the capability gaps of the member states, as well as show the consortia that high quality and high level of commitment can be beneficial. It would also provide much needed opportunities for international cooperation,

which in turn would make the next round of cooperation easier. In the following chapter, some recommendations will be given, from both a quality perspective and from a Swedish perspective.

7 Recommendations

In this final chapter, some recommendations based on the study will be presented. To begin with, general recommendations for improved quality of future programmes will be discussed. After that, some recommendations concerning a possible Swedish participation will follow. Of course, these recommendations can be of value for other nations as well.

7.1 Recommendations for Future Programmes

A few of the things that could be improved in future programmes have to do with the nature of novel programmes. Some rules and contingencies need to be planned ahead and communicated. This has to do with cases of project overlap and how to secure a decent degree of global balance.

Other possibilities for improvement have more to do with the programme characteristics. Increasing the threshold investment for participating member countries would increase the programme budget or reduce the number of participants, as well as increase the nations' interest in the programme, all of which would be beneficial for the programme quality. The mechanism of global balance should be kept, in order not lose the participation of too many countries. The setting with several calls needs to be kept in order for this to work. Consider adding an additional level of co-financing, which gives better intellectual property rights to the companies. There were concerns about intellectual property, and entities have shown that they are prepared to co-fund up to 50 per cent. This would increase incentives for co-funding of projects the companies believed in as well as increase the total programme budget.

7.1.1 Conclusions

- Add a higher level of co-funding, which grants additional intellectual property rights for companies concerned with that. Increases value for high quality projects.
- Demand a higher level of national investment to take part in the programme, ensures interest and reduces the number of participating member states.
- Plan for continuation of successful projects, so there is a "prize" to strive for.
- Keep setting with several calls with improvement. Consider adding more calls.
- Plan for case of project overlaps and present rules for bidders.

7.2 Recommendations for Sweden

Sweden's defence industry is dependent on exports, which often are achieved after international cooperation or after the Swedish Armed Forces has functioned as a reference customer. With a smaller defence budget as well as defence materiel supply strategy focusing on procurement of existing equipment from an open market, the Swedish Armed Forces are becoming a less active reference customer. Therefore, in order to keep a competent defence industry in Sweden, there is a need to support cooperative efforts.

7.2.1 Conclusions

- Keep, or increase, participation in small-scale international defence cooperation.
- Decide strategic goal of participation, promoting industry or equipping armed forces.
- Promote measures that keep the major nations in wider cooperation programmes.
- Push for multinational continuations of the most successful projects.

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8.4 Government Documents

European Union Directive 2009/81/EC

EDA Programme Arrangement PA No A-0120-RT-GC

EDA General Conditions applicable to ad hoc R&T Projects and Programmes of 7 April 2006

EDA 2013 National Defence Data 2011 EDA participating Member States

8.5 Interviewees

Besides a number of anonymous interviewees, these are the people interviewed during the course of completing the thesis.

8.5.1 Industry experts

Lars Ajaxon – Senior Adviser for the Swedish Security and Defence Industry Association

Gunnar Hult – Department of Military Studies, Swedish National Defence College

8.5.2 At the European Defence Agency

Jonas Nygårds – Programme Manager

Ulrich Karock – Original Programme Manager

Dinesh Chandramouli Rempling

Jérôme Garcia

Jari Hartikainen

Marek Kalbarczyk

Jean Marchal

Ignacio Montiel

Vincenzo Rinaldi

Michael Sieber

Gerlof de Wilde

Appendix 1 – Interview guide

Since the interviews were semi-structured, areas to be covered were in the interview guide instead of specific questions.

Questions to companies

- Describe your company's involvement in the JIP-FP.
- What was/would have been the overall motivations for taking part in the programme?
- How were consortia constructed?
    - Who initiated it? Several different?
    - Why was this the consortia to be part of?
    - How was contact established?
    - How did you decide the level of consortia co-financing? Individually?
    - How was the work share decided? Consortia size?
    - Were all members equally active/necessary?
- Were intellectual property rights a concern?
    - Did it affect the level of co-financing?
    - Would other intellectual property rights affect programme interest?
- Was this an area you would go into without the programme?
    - Would there be any economic rationale without the funding?
    - Can continue with the project without further funding?

Questions to programme representatives:

- Describe your involvement in the JIP-FP.
- How were consortia formed? Were they fixed?
    - How was the size of the consortia?
    - Were leads happy with consortia and vice versa?
    - Could the cooperation be improved?
- Was the list of entities by the Management Committee sufficient or were more added?
- How would you describe the quality of the proposals?
    - Was it State-of-the-art?
    - Any unnecessary duplication of work?
    - Any indications that the consortia could have more to give?
- Any needs for renegotiation? Requests for renegotiation from consortia?
- Were any deliverables rejected due to R&T excellence?
- Were there any indications that the consortia were keeping results to themselfs

Appendix 2 – Evaluation Guide for JIP-FP

A-0444-RT-GC JIP-FP Call 3 (Specify – Repeat the proposal ACRONYM and the Title from the cover sheet. Double click the [SPECIFY ACRONYM] text each marked in yellow below. The "text form field options" window opens. Change the default text as necessary. The Acronym only will be repeated on all pages.)

[SPECIFY ACRONYM]

1) "Capability Improvement" (Threshold Mark 3, Weight 3)	
Individual Mark: (Specify 0, 1, 2, 3, 4, or 5)	Individual Score: (Specify 0, 3, 6, 9, 12, or 15)

Capability Improvement – Structured Assessment	**Place(s) in Proposal**	**Evaluator's Remark**
1. Extent to which the proposal contributes to a credible and feasible capability improvement. Characterise in keywords / key figures further detailed in place(s) …	specify	
2. Extent to which this capability improvement best resolves the capability shortfalls described in the call for Proposals. Characterise in keywords / key figures further detailed in place(s) …	specify	
3. Proposers must demonstrate their understanding of the capability shortfall. Characterise in keywords / key figures further detailed in place(s) …	specify	
4. Proposers must demonstrate a clear knowledge of the desired capabilities. Characterise in keywords / key figures further detailed in place(s) …	specify	
5. They must explain how their proposal will contribute to tangible and demonstrable capability improvements. Characterise in keywords / key figures further detailed in place(s) …	specify	
6. Where relevant, proposers shall explain novel elements addressed in the proposal which are not covered by the scope of this call and the Programme, and explain why they are relevant. [Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
7. Proposers must indicate how the technological solution will transit into application. Characterise in keywords / key figures further detailed in place(s) …	specify	
8. They must outline the subsequent development work required. Characterise in keywords / key figures further detailed in place(s) …	specify	
9. They shall explain within which timeframe the improved capability could be achievable. Characterise in keywords / key figures further detailed in place(s) …	specify	
10. Proposers must state Capability Improvement related objectives of their proposal in a measurable and verifiable form. Characterise in keywords / key figures further detailed in place(s) …	Annex A5, specify	
11. They must plan appropriate performance indicators and milestones. During the implementation of the proposal, the progress will be measured against the goals. Characterise in keywords / key figures further detailed in place(s) …	Annex A5, specify	

2) "R&T Excellence" (Threshold Mark 3, Weight 3)	
Individual Mark: (Specify 0, 1, 2, 3, 4, or 5)	Individual Score: (Specify 0, 3, 6, 9, 12, or 15)

R&T Excellence – Structured Assessment	**Place(s) in Proposal**	**Evaluator's Remark**
12. Extent to which the proposed technological solution is feasible. Characterise in keywords / key figures further detailed in place(s) …	specify	
13. Extent to which the proposed technological solution meets or exceeds the R&T objective(s) in the call for Proposals. Characterise in keywords / key figures further detailed in place(s) …	specify	
14. Extent to which the R&T approach is innovative, sound and credible. Characterise in keywords / key figures further detailed in place(s) …	specify	
15. Proposers must demonstrate a clear knowledge of the state-of-the-art in the technological field(s) related to their proposal Characterise in keywords / key figures further detailed in place(s) …	specify	
16. They must demonstrate that their proposal exceeds the state of the art. Characterise in keywords / key figures further detailed in place(s) …	specify	
17. One of the two, the technological solution or the R&T approach, must be innovative, or both. Characterise in keywords / key figures further detailed in place(s) …	specify	
18. Proposers must explain that their R&T approach is sound. Characterise in keywords / key figures further detailed in place(s) …	specify	
19. Proposers must demonstrate that they have a clear understanding of critical technological issues and the related risks. Characterise in keywords / key figures further detailed in place(s) …	specify	
20. Proposers shall describe how the proposed technological solution and the proposed R&T approach will be exploited in addition to resolving the capability shortfall already covered under criterion 1 ("collateral benefit(s)"). Characterise in keywords / key figures further detailed in place(s) …	specify	
21. They shall outline the subsequent development work required for exploitation, e.g. in other capability areas, in further research, development and procurement, patent application or any other exploitation, inside and outside the defence remit. Characterise in keywords / key figures further detailed in place(s) …	specify	
22. If applicable, proposers must explain why R&T work carried out in other contexts may be duplicated and why this is considered necessary for the performance of the proposal. [Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
23. Proposers must state R&T related objectives of their proposal in a measurable and verifiable form.		
Characterise in keywords / key figures further detailed in place(s) …	Annex A5, specify	
24. Proposers must plan appropriate performance indicators and milestones. During the implementation of the proposal, the progress will be measured against the goals.		
Characterise in keywords / key figures further detailed in place(s) …	Annex A5,	

3) "Management" (Threshold Mark 3, Weight 2)	
Individual Mark: (Specify 0, 1, 2, 3, 4, or 5)	Individual Score: (Specify 0, 3, 6, 9, 12, or 15)

Management – Structured Assessment	**Place(s) in Proposal**	**Evaluator's Remark**
25. Extent to which the consortium has the requisite experience necessary to successfully implement the proposal. Characterise in keywords / key figures further detailed in place(s) …	specify	
26. Extent to which the consortium has the requisite skills necessary to successfully implement the proposal. Characterise in keywords / key figures further detailed in place(s) …	specify	
27. Extent to which the consortium has the requisite resources necessary to successfully implement the proposal. Characterise in keywords / key figures further detailed in place(s) …	specify	
28. Extent to which the consortium has the requisite organisation necessary to successfully implement the proposal. Characterise in keywords / key figures further detailed in place(s) …	specify	
29. Proposers must describe their analysis of the rules and the objective(s) in the calls for proposals. Characterise in keywords / key figures further detailed in place(s) …	specify	
30. Proposers shall explain how the proposed organisation and management addresses their findings. Characterise in keywords / key figures further detailed in place(s) …	specify	
31. Proposers must demonstrate the ability of the consortium to carry out the proposal successfully and ensure its efficient management. This includes: a. the description of the consortium management construct Characterise in keywords / key figures further detailed in place(s) …	specify	
b. an outline of the intended consortium agreement Characterise in keywords / key figures further detailed in place(s) …	specify	
c. the description of the key personnel coverage of the required scientific, technical and management disciplines Characterise in keywords / key figures further detailed in place(s) …	specify	
d. the description of the facilities to be used for R&T work, test and demonstration Characterise in keywords / key figures further detailed in place(s) …	specify	
e. including the demonstration of any unique capabilities pertinent to this R&T work. Characterise in keywords / key figures further detailed in place(s) …	specify	
32. Proposers must describe the roles and the relevant expertise of the consortium members in the proposed R&T work, R&T management, consortium management, systems analysis and systems integration Characterise in keywords / key figures further detailed in place(s) …	specify	
33. They shall describe their past performance in conducting similar efforts of the proposed scope. Characterise in keywords / key figures further detailed in place(s) …	specify	
34. Proposers must describe their plans for the management of knowledge, of intellectual property and of other innovation related activities arising in the		

Management – Structured Assessment		Place(s) in Proposal	Evaluator's Remark
	proposal. Characterise in keywords / key figures further detailed in place(s) …	specify	
35.	They shall outline their plans for		
a.	the management and mitigation of risk Characterise in keywords / key figures further detailed in place(s) …	specify	
b.	their quality management approach Characterise in keywords / key figures further detailed in place(s) …	specify	
c.	their configuration management approach Characterise in keywords / key figures further detailed in place(s) …	specify	
36.	If applicable, proposers must explain the ability of the consortium to protect classified information as necessary.		
	[Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
37.	If there are other issues associated with the proposal that are not covered elsewhere in the evaluation criteria, e.g. regarding (see a. to d. below). The proposers must explain how these issues have been adequately taken into account.		
a.	national and international regulations or standards [Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
b.	required background information [Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
c.	export licensing [Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
d.	other [Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
38.	Proposers must state management related objectives of their proposal in a measurable and verifiable form.		
	Characterise in keywords / key figures further detailed in place(s) …	Annex A5, specify	
39.	They must plan appropriate performance indicators and milestones. During the implementation of the proposal, the progress will be measured against the goals.		
	Characterise in keywords / key figures further detailed in place(s) …	Annex A5, specify	

4) "Value for Money" (Threshold Mark 3, Weight 2)	
Individual Mark: (Specify 0, 1, 2, 3, 4, or 5)	Individual Score: (Specify 0, 3, 6, 9, 12, or 15)

Value for Money – Structured Assessment	**Place(s) in Proposal**	**Evaluator's Remark**
40. Extent to which the proposed cost is consistent with proposed effort. Characterise in keywords / key figures further detailed in place(s) …	specify	
41. Proposers shall explain their cost planning approach based on the activities proposed, essential to fulfil the requirements in the call for proposals, and of the scope and context of the Programme. Characterise in keywords / key figures further detailed in place(s) …	specify	
42. a. Proposers shall describe their efforts to target the cost of the proposal, through seeking synergies with civilian and security capability technologies Characterise in keywords / key figures further detailed in place(s) …	specify	
b. other efforts [Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
43. Proposers shall explain opportunities for further cost reduction and their respective enablers.		
Characterise in keywords / key figures further detailed in place(s) …	specify	
44. They should outline major cost drivers, the related risks, and the proposed control mechanisms.		
Characterise in keywords / key figures further detailed in place(s) …	specify	
45. Proposers shall explain how they determined the requested JIP-FP contribution to their proposal.		
Characterise in keywords / key figures further detailed in place(s) …	specify	

5) "Cooperation" (Threshold Mark 2, Weight 2)	
Individual Mark: (Specify 0, 1, 2, 3, 4, or 5)	Individual Score: (Specify 0, 3, 6, 9, 12, or 15)

Cooperation – Structured Assessment	**Place(s) in Proposal**	**Evaluator's Remark**
46. Extent to which the consortium composition contributes to building and sustaining an effective European defence R&T base. Characterise in keywords / key figures further detailed in place(s) …	specify	
47. Proposers must describe a. their consortium building approach Characterise in keywords / key figures further detailed in place(s) …	specify	
b. how end user requirements are represented in the consortium Characterise in keywords / key figures further detailed in place(s) …	specify	
c. how industrial user requirements are represented in the consortium Characterise in keywords / key figures further detailed in place(s) …	specify	
48. They shall describe how the opportunity of involving innovating SMEs, universities and non-government laboratories has been addressed. Characterise in keywords / key figures further detailed in place(s) …	specify	
49. Proposers should show how the participants are suited and committed to the tasks assigned to them. Characterise in keywords / key figures further detailed in place(s) …	specify	
50. Proposers should explain the complementarities among the consortium members. Characterise in keywords / key figures further detailed in place(s) …	specify	
51. They should outline how the consortium could evolve in the future. Characterise in keywords / key figures further detailed in place(s) …	specify	
52. They should outline how new members could be integrated into the consortium, if appropriate. [Conditional] Characterise in keywords / key figures further detailed in place(s) …	specify	
53. As appropriate, proposers should describe the cooperation opportunity with a. other proposals under the Programme [Conditional] Characterise in keywords / key figures further detailed in place(s) …	Annex A1, specify	
b. the European Security Research Programme [Conditional] Characterise in keywords / key figures further detailed in place(s) …	Annex A1, specify	
c. with other relevant programmes [Conditional] Characterise in keywords / key figures further detailed in place(s) …	Annex A1, specify	
54. If any substantial part of the proposed management work or the R&T work is foreseen to be subcontracted outside the consortium, the proposers must a. designate the work involved [Conditional] Characterise in keywords / key figures further detailed in place(s) …	Annex A1, specify	
b. explain why a subcontracting approach has been chosen for it, rather than		

Appendix 3 - Scores in evaluation and requests for funding

Only proposals above the treshold. The information is presented to avoid identification.

Total score	Quality proxy	JIP funding €M	Selected?
58	30	2,9	*
53	27	2,4	*
53	27	2,4	*
53	27	2,1	*
51	27	3,7	*
51	27	3,4	*
51	27	3,4	*
51	27	2,8	*
50	24	2,0	
49	27	8,0	*
48	24	2,2	*
48	24	3,9	*
48	24	3,5	
48	24	1,7	*
48	24	2,4	*
48	24	2,7	*
48	24	2,2	*
47	21	2,9	*
46	24	5,7	
46	24	3,3	
46	24	3,1	*
46	24	2,1	*
46	24	2,0	
46	24	3,3	
46	24	2,6	
45	21	0,8	
45	21	1,5	
45	21	2,5	
45	21	4,8	
44	24	0,8	
44	24	2,3	
44	24	5,0	
44	24	5,9	
44	24	2,2	
43	21	3,0	
43	21	4,2	
43	21	5,6	
43	21	1,6	
43	21	2,6	
43	21	2,1	
43	21	3,4	
42	18	1,3	

Appendix 4 - Country participation in programme

Here are the number of enteties in each call present on the list of potential contractors, in submitted proposals and in selected consortia. Consortia leaders in parenthesis.

	Call 1			Call 2			Call 3			Call 4			
	Listed	**In prop.**	**Selected**	**Listed**	**In prop.**	**Selected**	**Listed**	**In prop.**	**Selected**	**Listed**	**In prop.**	**Selected**	**Total in prop.**
AT - Austria	12	5	**3**	11			14			21	4	**1**	9
BE - Belgium	2	4	**1**	1	1		1	2	**1**	1	2	**1**	9
CY - Cyprus	2	2		4									2
CZ - Czech Republic	4	2		12	3		6	4	**1**				9
DE - Germany	33	41	**6 (1)**	41	16	**5 (1)**	15	10	**5**	14	5	**2**	72
EE - Estonia	3	1		7	1		1	2		5	5	**2**	9
EL - Greece	10			14	6		14	7	**3**	9	6	**1**	19
ES - Spain	6	10	**1 (1)**	25	7	**3**	16	7	**2 (1)**	33	2		26
FI - Finland	7	5	**1**	10	1	**1**	9	8	**1**	8	2	**1**	16
FR - France	31	27	**10 (3)**	35	15	**4 (1)**	5	11	**3**	37	17	**7 (3)**	70
HU - Hungary	17	1		13	2		12	3	**2**	6			6
IE - Ireland	0			1			1	4	**2**	5	4		8
IT - Italy	27	9	**3**	34	19	**4 (1)**	24	13	**4 (3)**	24	1		42
NL - the Netherlands	12	9		14	6	**1**	6	5	**2 (1)**	12	9	**6 (2)**	29
NO - Norway	6	2	**1**	6	1		1	2		1	5	**2**	10
PL - Poland	27	16	**2**	29	17	**5**	13	9	**4**	19	19	**8**	61
PT - Portugal	8	3	**1**	15	5	**3**	12	1		5			9
SE - Sweden	12	8	**1**	10	4	**1**	4	6	**1**	6	2	**1**	20
SI - Slovenia	47	3	**1**	23			1	1		11	3	**1**	7
SK - Slovakia	4			1	4		0	2		2	6	**3**	12
	270	148	31	306	108	27	155	97	31	219	92	36	

Appendix 5 - Scores in evaluation and requests for funding

Different tables to avoid identification. * indicates mean value.

Consortia size	Quality proxy
17	21
16	24
14	21
13	27
12	21
11	27
10	24
10	18
9	18
8	30
8	27
8	24
8	24
8	24
8	18
8	15
7	27
7	24
7	24
7	24
7	24
7	21
7	21
7	21
7	21
7	15
7	12
7	12
6	27
6	27
6	27
6	27
6	24
6	24
6	21
6	21
6	21
6	18
6	15
6	15
5	24
5	24

% Co-fund	Quality proxy
50	18
50	21
50	18
41	24
40	15
40	21
39	18
36	24
36	24
35	27
33	24
32	12
30	12
30	24
28	15
27	27
27	27
25	24
25	21
24	24
24	27
24	24
23	24
23	18
22	27
21	24
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20	21
20	18
20	24
20	18
20	24
20	27
20	24
20	21
20	30
19	24
17	21
16	21

5	24
5	21
5	21
5	21
5	21
5	18
5	15
5	12
4	24
4	24
4	24
4	24
4	21
4	18
4	18
4	18
4	15
4	15
4	12
4	6
3	24
3	24
3	21
3	21
3	21
3	21
3	21
3	18
3	18
3	12

16	21	
15	24	
14	21	*
14	15	*
14	21	*
14	15	*
14	15	*
14	18	*
14	18	*
14	15	*
14	15	*
14	21	*
14	21	*
14	21	*
14	18	*
14	18	*
13	24	
13	21	
12	21	
9	21	
8	24	
6	21	
6	12	
5	24	
-	12	
-	21	
-	24	
-	21	
-	6	
-	12	